

DEVELOPMENT OF ENVIRONMENTAL FACTORS IN CLASSROOM DESIGN RECOMMENDATION FOR CHILDREN WITH AUTISM SPECTRUM DISORDER

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**DEVELOPMENT OF ENVIRONMENTAL
FACTORS IN CLASSROOM DESIGN
RECOMMENDATION FOR CHILDREN WITH
AUTISM SPECTRUM DISORDER**

by

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LIST OF ABBREVIATIONS

ASD	Autism spectrum disorder
FM	Frequency modulation
Q-Q	Quantile-quantile

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CADANGAN PEMBANGUNAN FAKTOR-FAKTOR PERSEKITARAN DALAM REKA BENTUK BILIK DARJAH UNTUK KANAK-KANAK AUTISMA

ABSTRAK

Persekitaran pembelajaran di pusat kanak-kanak yang mempunyai gangguan autisme direka berdasarkan kanak-kanak tipikal yang sihat. Idealnya, persekitaran pembelajaran untuk kanak-kanak ini perlu mengambilkira keperluan berfungsi, emosi dan tingkah laku mereka yang unik. Reka bentuk yang tidak sesuai akan menjadikan pembelajaran kurang berkesan disebabkan oleh gangguan, keadaan yang tidak selesa dan berlakunya tingkah laku yang tidak menyenangkan. Oleh itu, intervensi ergonomik perlu diperkenalkan. Kajian ini mengkaji kesan lima faktor persekitaran fizikal bilik darjah terhadap pemahaman arahan dan juga tahap tumpuan kanak-kanak autisme di dalam bilik darjah. Pemerhatian terhadap tingkah laku, emosi dan kognitif kanak-kanak autisme dijalankan untuk setiap faktor persekitaran fizikal bilik darjah. Mereka menjalani dua jenis eksperimen bagi setiap faktor persekitaran fizikal. Kaedah kualitatif dan kuantitatif digunakan bagi kajian ini. Dua eksperimen telah dijalankan untuk mengambil masa bagi tindakbalas terhadap arahan (ukuran bagi pemahaman) dan masa yang diambil untuk menyelesaikan tugas (ukuran tahap tumpuan). Eksperimen dijalankan dengan sebelas orang kanak-kanak autisme berumur di antara lima hingga sembilan tahun tetapi usia mental mereka adalah antara empat hingga lima tahun. Manakala kanak-kanak normal berusia empat hingga lima tahun digunakan sebagai kumpulan perbandingan bagi keputusan yang diperolehi. Faktor persekitaran fizikal yang dikaji adalah bunyi, frekuensi, keamatan cahaya, jenis-jenis

warna dan suhu dalam kelas. Bagi kanak-kanak autisma, lima tahap bagi setiap faktor dijalankan bagi setiap eksperimen. Pendekatan pra-ujikaji (keadaan semasa) dan pasca-ujikaji (keadaan intervensi) digunakan tetapi untuk faktor bunyi sahaja. Faktor-faktor fizikal yang lain diuji menggunakan kaedah eksperimen tipikal. Kaedah pemerhatian dijalankan untuk kesemua faktor-faktor fizikal bagi mengkaji tindak balas tingkah laku, emosi dan kognitif kanak-kanak autisma. Analisis dilakukan dengan menggunakan kaedah analisa statistik bagi mendapatkan kesan faktor-faktor persekitaran terhadap tindak balas arahan dan tahap tumpuan. Analisis kualitatif dilaksanakan untuk menilai tindak balas terhadap tingkah laku emosi dan kognitif. Keputusan kajian menunjukkan bahawa keadaan intervensi menyebabkan peningkatan yang ketara dalam tahap pemahaman dan tumpuan dalam melaksanakan tugas bagi kanak-kanak autisma berbanding dengan keadaan persekitaran semasa. Nilai optimum yang diperolehi ini dicadangkan dalam reka bentuk persekitaran pembelajaran khusus untuk kanak-kanak autisma di Malaysia.

DEVELOPMENT OF ENVIRONMENTAL FACTORS IN CLASSROOM DESIGN RECOMMENDATION FOR CHILDREN WITH AUTISM SPECTRUM DISORDER

ABSTRACT

Typical learning environment at a centre for children with autism spectrum disorder (ASD) are designed based on healthy normal children. Ideally, the learning environment for these children should complement their unique functional, emotional and behavioural requirements as inappropriateness will cause distraction, uncomfortable condition and occurrence of undesirable behaviour. Hence ergonomic intervention needs to be introduced. This research study the impact of five different factors of the physical classroom environment on children understanding instructions and their attention span in the classroom. Observation on behaviour, emotion and cognitive of those children carried out for each physical classroom environment factor. They were subjected to two types of experiments for each physical environment factors. Qualitative and quantitative methods were carried out. Two experiments were conducted to measure individual's response time to instruction (speed of understanding) and time to complete a task (a measurement of attention span). The experiment deployed eleven children with ASD aged between five to nine years old. Their mental age is between four to five years. A control group with normal children age four to five years was also used for comparison. The physical environment factors being studied are sound decibel, sound frequency, the intensity of the light intensity, type of colour and temperature within the classroom. For the children with ASD, five different levels of each factor were set up for each

experiment. Pre-tests (current condition) and post-tests (intervention condition) approach are only applied for sound. The other physical factors were done using typical experimental techniques. Observation method was deployed in all physical factors to study the children with ASD behavioural, emotional and cognitive reaction. Statistical analysis tools are used to quantitatively evaluate the effect of environmental factors on the response time and attention span. Qualitative analysis tools were executed to assess the behavioural, emotional and cognitive reaction. The finding showed that ergonomic intervention caused significant improvement in the speed of understanding and attention span during task performing for the children with ASD compared to their current learning environment. Restlessness and uncomfortable behaviour had also decreased significantly within an optimum range of each physical factor. However, their performance is still slower than normal children. Those optimal values of the environmental factor are recommended in the design of the learning environment specifically for children with ASD in Malaysia.

CHAPTER 1

INTRODUCTION

1.1 Background

This chapter begins with the characteristics of the children with autism followed by appropriate physical and psychosocial learning environment in an existing learning centre for autism. These two factors stimulate the intention of conducting this research to develop the ergonomic guideline for a learning environment that fits with these special children.

Autism spectrum disorder (ASD) is first generally diagnosed in childhood and differs from one person to another in severity and combinations of symptoms. The specific symptoms and the severity are highly variable among different individuals because it has a spectrum, a capability or functionality and a wide range of conditions (Baird et al., 2003; Idris et al., 2014). There are three main symptoms of disabilities in children with ASD; issues with social interaction, problems with communication and repetitive behaviour and interests (Baird et al., 2003; Engeland & Buitelaar, 2000; Radunovich & Kochert, 2011). Children with ASD often faced these characteristics with some are mildly impaired by their symptoms, while others are severely disabled. Because of these characteristics, young ASD children show less interest and awareness of other peers while older children do not have the appropriate peers, isolated from the community and easily bullied. It also affects their learning process, especially in formal education.

A large amount of the student's time is spent sitting in a classroom during learning activities. This place is where they will learn various skills deemed necessary and proper for them to achieve success in a global society. Learning environments are

extremely important for students and also for teachers. It will affect the emotion, behaviour and how well a student receives the instruction and gives the attention. Also, it is a second teacher for any student and may provide a different concept of learning based on the first impression. Creating a positive and fit learning environment for the students is essential for success in the classroom. It requires a diligent effort to produce a good learning environment for students with special needs where the physical and psychophysical environments emphasized.

Classroom design often feels cramped and undersized cause the limitation of the movement and increased stress level and distractions (Arnaiz et al., 2011; McAllister & MaGuire, 2012; Miller & Cunningham, 2015). These distractions are due to lack of consideration in the physical environment for children with ASD. A distraction-free and structured environment is the most helpful strategies for children with ASD who can easily be distracted and overwhelmed by too much input and also have visual perceptual difficulties (Autism Queensland Inc, 2016).

A deeper awareness of physical environment characteristics must be acquired by designers or educators to create a good fit learning environment for children with ASD in the classroom (Woronko & Killoran, 2011). The background sound levels supply a significant impact to the learning since it will disturb in concentration, increase stress and causing undesirable behaviour due to sensory overload (Arnaiz et al., 2011; Woronko & Killoran, 2011). Lighting aspect also crucial because it involves the ability of student to see clearly in the learning activities (Amirul et al., 2013; Thahir, 2017; Winterbottom & Wilkins, 2009) while in the previous studies by Gaines & Curry, (2011) and Thahir, (2017) stated that colour affects the way student perceive a space and influences their psychological responses to include changes in mood and